

# KADI SARVA VISHWAVIDYALAYA GANDHINAGAR



## B.Sc. CHEMISTRY SYLLABUS

## Kadi Sarva Vishwavidyalaya, Gandhinagar

### B. Sc. Chemistry

**Course Description:** This course is designed to enable students to acquire understanding of fundamentals of Chemistry. The course provides practical training on chemical techniques and processes to extract useful knowledge in the areas of Organic, Inorganic, Physical and analytical Chemistry for upcoming industries and institutes. It also provides opportunities for developing new chemical products and techniques for the benefit of society.

#### COURSE STRUCTURE:

Year	Semester	Paper	Paper Name	Marks	Practical	Total Marks
B.Sc I	I	CCH-101	Fundamental Chemistry I	100	50	150
	II	CCH-201	Fundamental Chemistry II	100	50	150
B.Sc II	III	CCH-301	Organic and Physical Chemistry	100	50	150
		CCH-302	Inorganic and Biochemistry	100	50	150
	IV	CCH-401	Physical and Organic Chemistry	100	50	150
		CCH-402	Inorganic and Analytical Chemistry	100	50	150
B.Sc III	V	CCH-501	Fundamentals of Inorganic Chemistry	100	200	600
		CCH-502	Fundamentals of Organic Chemistry	100		
		CCH-503	Fundamentals of Physical Chemistry	100		
		CCH-504	Fundamentals of Analytical Chemistry	100		
	VI	CCH-601	Advanced Inorganic Chemistry	100	200	600
		CCH-602	Advanced Organic Chemistry	100		
		CCH-603	Advanced Physical Chemistry	100		
		CCH-604	Advanced Analytical Chemistry	100		

### Third Year B.Sc. (Chemistry)

### Semester V

Subject code	Study components	Instructions Hrs / week	Examination			Credit
			Internal	University Exam	Total	
<b>CCH-501</b>	Fundamentals of Inorganic Chemistry	3	30	70	100	3
<b>CCH-502</b>	Fundamentals of Organic Chemistry	3	30	70	100	3
<b>CCH-503</b>	Fundamentals of Physical Chemistry	3	30	70	100	3
<b>CCH-504</b>	Fundamentals of Analytical Chemistry	3	30	70	100	3
<b>PCH-501</b>	Chemistry Practical-V	12		200	200	6
<b>ECH- 501 A OR ECH- 501 B</b>	Synthetic Dyes OR Oils, Fats and Waxes	2		50	50	2
<b>EGC- 501</b>	Environmental science & Disaster Management	2		50	50	2
<b>FCG-501</b>	Compulsory English (L.L.)	2	15	35	50	2
		30	135	615	750	24

## CCH-501-Fundamentals of Inorganic Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of inorganic chemistry.

Its origin and structure helps the potential application of the unexplored and unidentified chemicals in the industry.

### **LEARNING OUTCOMES:**

- Understand the concepts of inorganic chemistry
- Develop an understanding of the chemical systems around us
- Gain knowledge about the structure, function and applications of various chemicals

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH-501	Fundamentals of Inorganic Chemistry	3	45	30	70	100

### **COURSE CONTENT:**

#### **UNIT- I : Molecular symmetry**

**Number of lectures: 15**

**Weightage:34%**

- Introduction, symmetry operations and symmetry elements:  $C_n$ ,  $\sigma$ ,  $S_n$ ,  $i$  and  $E$ .
- Point groups for the molecules (excluding  $S_{2n}$  and  $I_h$ ).
- Multiplication tables of  $C_{2v}$ ,  $C_{2h}$  and  $C_{3v}$  point groups.

#### **UNIT- II : Organo Metallic Compounds**

**Number of lectures: 15**

**Weightage:33%**

- Definition
- Types of O.M.C.  
Classification
- Nomenclature of O.M.C
- Structure and bonding in dihapto and metal olefins complexes. e.g. Ziese's salt complexes, ferrocene structure
- O.M.C. of Li and Al complexes

**UNIT – III : Reaction Mechanism of Coordination Compounds****Number of lectures: 15****Weightage:33%**

- Substitution reaction of square planar complexes
- Reaction of Platinum II complexes, the trans effect, theories of trans effect, use of trans effect in synthesis and analysis
- Substitution reaction in octahedral complexes, Possible mechanism reactions, Ligand displacement reaction in octahedral complexes, acid hydrolysis, Base hydrolysis
- Electron transfer reaction, mechanism of redox reaction, mechanism of substitution in square planar complexes

**REFERENCES**

1. Valency and Molecular structure by Cartmell and Fowles.
2. Text book of Inorganic Chemistry by Durrant and Durrant.
3. Inorganic Chemistry by G. D. Tuli
4. Advance Inorganic Chemistry Vol-II Satya Prakash (S.Chand)
4. Concise Inorganic chemistry by J.D.Lee.
5. Inorganic Chemistry: Principles of Structure and Reactivity by James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi
6. Advanced inorganic chemistry by Cotton and Wilkinson
7. Chemical applications of Group theory by F. A. Cotton

**INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Chemistry
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

**TEACHING AND EXAMINATION**

<b>UNIT</b>	<b>Examination Scheme % Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH-502- Fundamentals of Organic Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of organic chemistry

### **LEARNING OUTCOMES:**

- Understand the concept of various organic reactions.
- Develop an understanding of the organic systems around us.
- Gain knowledge about the structure, function and applications of various organic compounds.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH-502	Fundamentals of Organic chemistry	3	45	30	70	100

### **COURSE CONTENT:**

#### **UNIT- I : Stereochemistry 3**

**Number of lectures: 15**

**Weightage:34%**

- Conformational analysis of mono and di substituted cyclohexanes
- Molecular asymmetry as illustrated by allenes and diphenyls
- Isomerism of oximes.
- Determination of geometrical isomerism of Aldoxime.
- Determination of geometrical isomerism of Ketoxime(Beckmann's transformation)

#### **UNIT- II Nucleophilic substitution at saturated carbon atom**

**Number of lectures: 15**

**Weightage:33%**

- The reaction mechanism
- Stereochemistry of Nucleophilic substitution
- Scope of nucleophilic substitution
- Stereochemistry of SN<sup>1</sup> and SN<sup>2</sup> reaction
- Relative reactivity in substitution
- Solvent effect variation at carbon site

- Relative leaving group activity
- Neighboring group participation
- Competitive reactions. Elimination E1, E2 and E1c<sub>b</sub> mechanisms

### UNIT- III : : Nucleophilic Aromatic Substitutions

Number of lectures: 15

Weightage: 33%

- Nucleophilic aromatic substitution [Bimolecular displacement (S<sub>N</sub>2) mechanism]
- Elimination – Addition mechanism via benzyne
- Stability and properties of benzyne
- Evidences of Benzyne intermediate

### REFERENCES

#### Organic Chemistry

1. Organic chemistry by Morrison & Boyd V<sup>th</sup> Edition
2. Advance organic chemistry by R.K.Bansal.
3. Organic chemistry by I.L.Finar Vol I & II V<sup>th</sup> Edition
4. Organic chemistry by pine, Hendrikson, Cram and Hammond IV<sup>th</sup> edition...
5. Synthetic organic chemistry by Gurdeep R Chatwal.
6. Advanced organic chemistry by Jerry March.
7. Organic reactions and their mechanisms II<sup>nd</sup> edition by P.S. Kalsi.
8. Stereo chemistry: conformation and mechanism VI<sup>th</sup> edition by P.S.Kalsi.
9. Organic chemistry of natural product Vol: I & II by Gurdeep R. Chatwal.
10. Advanced organic chemistry by Arun Bahal and B.S. Bahal.
11. Organic chemistry Vol, I, II, III by S.M.Mukherjee, S.P.Singh, R.P.Kapoor.
12. Stereo Chemistry by Nasipuri.

### INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Chemistry
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

### TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH 503- Fundamentals of Physical Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the basic principles of physical chemistry.

**LEARNING OUTCOMES:**

- Understand the concept of physical sciences.
- Develop an understanding of the various physical chemistry laws and its applications.
- Gain knowledge about the physical chemistry existing in and around the society.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH- 503	Fundamentals of Physical Chemistry	3	45	30	70	100

### COURSE CONTENT

<b>UNIT- I : Electro Motive Force</b> <b>Number of lectures: 15</b>	<b>Weightage:34%</b>
<ul style="list-style-type: none"><li>• Chemical Cell: Without Transference &amp; with Transference Verification of Concentration cell and it's EMF equation.</li><li>• Electrolyte concentration cell</li><li>• Concentration cell without transference, Concentration cell with transference Electrode concentration cell</li><li>• Amalgam concentration cell, Gas Concentration Cell Liquid –Liquid junction potential</li><li>• Application of EMF measurements</li><li>• Determination of Degree of hydrolysis of salt</li><li>• Solubility of sparingly soluble salt</li><li>• Stability constant of complex,</li><li>• Dissociation constant of weak acid, Numericals</li></ul>	
<b>UNIT- II : Thermodynamics</b> <b>Number of lectures: 15</b>	<b>Weightage:33%</b>
<ul style="list-style-type: none"><li>• Zeroth law of thermodynamics</li><li>• Absolute temperature scale</li></ul>	



- Nernst heat theorem
- Third law of thermodynamics
- Determination of absolute entropy
- Experimental verification of third law
- Entropy change in chemical reactions.
- Concept of Fugacity and determination of Graphical Method
- Numerical

### **UNIT- III : Macromolecules**

**Number of lectures: 15**

**Weightage:33%**

- Classification of Polymers
- Tacticity of polymers. ( Optical Isomers)
- Polymerization reaction with example
- Addition Polymerization. ( Polyethylene, Polystyrene, PVC)
- Condensation Polymerization (Nylon-66, Dacron)
- Mechanisms of Polymerization
- Free radical chain Polymerization
- Anionic Polymerization
- Cationic Polymerization
- Kinetics of Free radical chain Polymerization Degree of Polymerization
- Molar masses of Polymer
- Number Average Molar Mass
- Weight Average Molar Mass
- Determination of Molar Masses of Macro Molecules
- Viscosity Method Light Scattering Method
- Numerical

### **REFERENCES:**

1. Advance Physical Chemistry by Gurdeepraj.
2. Physical Chemistry (Question and Answer) by R. N. Madan, G.D. Tuli, S.Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P. Rastogi and R.R.Mishra.
5. Physical chemistry by atkins.
6. Essentials of Physical Chemistry by B. S. Bahal, Arun Bahal, G.D.Tuli,
7. Physical Chemistry by P.W. Atkins, 5<sup>th</sup> edn, Oxford 1994 7<sup>th</sup> edn-2002.
8. Physical Chemistry by R.A. Albern and R.J.Silby, John Wiley 1995.
9. Physical Chemistry by G.H. Barrow, 5<sup>th</sup> edn, Mac Graw Hill, 1988,6<sup>th</sup> edn, 1996.
- 10.Physical Chemistry by W.J.Moore, 4<sup>th</sup> edn, Orient Longmans 1969.

## INSTRUCTION STRATEGIES

- Interactions with the students to understand the level of students
- Explaining & Discussing the major terminologies related to Chemistry
- Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
- Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH 504- Fundamentals of Analytical Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the basic principles of analytical chemistry.

### **LEARNING OUTCOMES:**

- Understand the concept of Analytical chemistry.
- Develop an understanding of analytical chemistry and its applications.
- Gain knowledge about the analytical chemistry existing in and around the society.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH- 504	Fundamentals of Analytical Chemistry	3	45	30	70	100

### **COURSE CONTENT**

<b>UNIT:- I : Good Laboratory Practices</b> <b>Number of lectures: 15</b>	<b>Weightage:33%</b>
<ul style="list-style-type: none"><li>• Introduction</li><li>• Validation of Analytical Methods</li><li>• Quality Assurance</li><li>• Laboratory accreditation</li><li>• Electronic records and electronic signatures</li><li>• Official organizations for GLP</li></ul>	
<b>UNIT:- II : Electro analytical Techniques:</b> <b>Number of lectures: 15</b>	<b>Weightage:34%</b>
<b>A. Polarography</b> <ul style="list-style-type: none"><li>• Introduction, Principle, electrode, Types of currents</li><li>• Determination of half wave potential, Ilkovic equation</li><li>• Methods of determining concentration (Standard addition method and Calibration method)</li></ul>	

### **B. Potentiometry**

- The scope of potentiometric titrations
- Precipitation and neutralization titrations
- Graphical method including Gran's plot for selecting end point
- Differential titration, Dead stop titration
- Ion selective Electrode, various types of Ion selective Electrodes and use of Calcium ion selective electrode.

### **UNIT :- III : Chromatography**

**Number of lectures: 15**

**Weightage:33%**

- Introduction
- Types of chromatography Column chromatography Paper chromatography
- Thin layer chromatography
- Ion exchange chromatography

### **Suggested books: (Analytical chemistry)**

1. Analytical Chemistry G.D. Christain
2. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J.Holler
3. Principles of Analytical Chemistry J.H. Kennedy
4. Analytical Chemistry – Principles & Techniques L.G.Hargis
5. Instrumental Methods of analysis: (CBS) H. H . Willard, L.L. Mirrit, J.A. Dean
6. Chemical Instrumentation: A Systematic approach- H.A. Strobel
7. The principals of ion-selective electrodes and membrane transport: W.E.Morf
8. Principles of Instrumental Analysis: Douglas A. Skoog., F. James Holler, Stanley R. Crouch, Cengage Learning; 6th Edition.
9. Quantitative Chemical Analysis: Daniel C. Harris, W H Freeman, New York.
10. Ion exchange and solvent extraction of metal compounds: Y. Macros, A.S.Kertes, Wiley, Interscience.

### **INSTRUCTION STRATEGIES**

- Interactions with the students to understand the level of students
- Explaining & Discussing the major terminologies related to Chemistry
- Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
- Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	33	15
Unit II	34	15
Unit III	33	15
Total	100	45

## PCH 501-Chemistry Practical-V

**RATIONALE:** This course is designed to enable students to acquire hand-on basic understanding of the chemical world, its origin and structure to help the potential application of the unexplored and unidentified compounds in the industry. These practical make the students capable and competent to work in chemistry related industries.

### LEARNING OUTCOMES:

- Understand the concept of origin of chemistry.
- Develop an understanding of the chemical properties of compounds.
- Gain knowledge about the structure, function and applications of the chemicals compounds.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. General viva-voce will be conducted to analyze the knowledge of the student.

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PCH- 501	Chemistry Practical-V	6	12	200	100

### Laboratory Course

#### PCH - 501

#### (Inorganic, Organic, Physical Chemistry)

This syllabus is to be completed by assigning four laboratory session per week, each of Three periods. The number of students in the laboratory batch should not exceed fifteen (15) the medium of instruction will be English in laboratory course

#### Inorganic Chemistry practical

#### (A) Alloy (gravimetry & volumetry to be done during regular lab; any one for the practical exam)

- 1) Brass alloy ----- Zn (Gravimetric) and Cu (Volumetric)
- 2) German silver alloy -----Ni (Gravimetric) and Cu (Volumetric)
- 3) Bronze alloy -----Sn (Gravimetric) and Cu (Volumetric)

#### (B) Synthesis by Convention Method

- 1) Ferrous Sulphate or Green vitriol ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ )

2) Sodium cobaltinitrate  $\text{Na}_3 [\text{Co}(\text{NO}_2)_6]$

3) Tetra amine cupric sulphate

4) Hexa thio urea plumbous nitrate

5) Cuprous chloride

### Organic Chemistry practical

#### (A) Qualitative Analysis (Minimum 08)

Analysis of an organic mixture containing two components using water,  $\text{NaHCO}_3$ ,  $\text{NaOH}$ ,  $\text{HCl}$  for Separation /or using distillation process for separation and identification with the Preparation of Suitable derivatives.

Soluble Components:- Oxalic Acid, Succinic Acid, Resorcinol, Urea, Thio Urea

Separation of two components from Organic Mixture Such as....

Solid-Solid -----Mixture

Solid- Liquid -----Mixture

Liquid-Liquid ----- Mixture

[Liquid component must be neutral in nature]

### Physical Chemistry practical

#### [A] Instruments: (Minimum 05)

1. To determine normality and amount of  $\text{HCl}$  and  $\text{CH}_3\text{COOH}$  in the given solution by Conductometric titration against  $\text{NaOH}$  solution.
2. To determine the solubility product and solubility of sparingly soluble salts  $\text{PbSO}_4$  by Conductometry.
3. To determine Normality and amount of each acid in the given mixture of  $\text{HCl}$  +  $\text{CH}_3\text{COOH}$  by pH metrically.
4. To determine the strength of strong and weak acid in a given mixture by Potentiometric titration using 0.1 N  $\text{NaOH}$
5. To determine the concentration of Nickel in the given solution by

Colourimetric estimation.

6. To determine the concentration of unknown solution from given  $\text{KMnO}_4$  solution by Colourimetry.

**Kinetics & Distributions: (Minimum 03)**

7. To determine the order of the reaction between  $\text{K}_2\text{S}_2\text{O}_8$  and KI.
8. To determine the order of the reaction between  $\text{H}_2\text{O}_2$  and HI.
9. To determine the distribution coefficient of Iodine between  $\text{CCl}_4/\text{CHCl}_3$  & water at a given temperature.
10. To study the distribution of Benzoic acid between Benzene and water at room temperature and prove the dimerization of Benzoic acid in Benzene.

**INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.



## Semester : V

### Pattern of University Practical Exam

Time: 10:30am to 6:00pm (Including 30 minutes recess) Total Marks: 200

#### First Day

##### **(A) Inorganic (50 marks)**

- Estimation from Alloy [30 marks= equation (4)+ Theoretical calculations (3) + Practical calculations (8) + presentation (5) ] and Inorganic Preparation ( 20 marks)

##### **(B) Organic (50 marks) [nature (10) + 20 marks for each compound]**

- Qualitative analysis of an organic mixture.

#### Second Day

##### **(C) Physical (50 marks)**

- Any one exercise should be selected for each candidate from syllabus.

##### **(D) Viva-Voce and Journal**

###### **Viva-Voce on practical base (40 marks)**

- Inorganic .....13 marks
- Organic .....13 marks
- Physical .....14 marks

###### **Journal (10 marks)**

**Note: Certified practical journal is compulsory for practical exam.**

## FCG 501- Basic English – V

**RATIONALE:** This course is designed to enable students to acquire basic understanding of English grammar. The course would help students to fortify their knowledge of English and strengthen their basic communication abilities.

### LEARNING OUTCOMES:

- Develop language skills of reading through filling in appropriate words in blanks, correcting errors, choosing correct forms out of alternative choices, etc.
- Acquire interest in English language and literature through textbook lessons.
- Acquire translation skill through translate from English to Gujarati/Hindi exercises
- Acquire the knowledge of different kinds of dialogue writing.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term Examination conducted by University examination for 35 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
FCG - 501	Basic English – V	2	24	15	35	50

### COURSE CONTENT

<b>Number of lectures: 8</b> <b>Unit 1: Lesson 1 :<i>An Astrologer's Day</i> by R.K.Narayan</b> <b>Lesson 5 :<i>Vanishing Animals</i> by Gerald Durrell</b> <b>Lesson 6 :<i>Education: India and America</i> by Anurag Mathur</b> <b>Poem 11 : <i>Where the mind is without Fear</i> by Rabindranath Tagore</b> <b>Poem 12 : <i>Stopping by Woods on a Snowy Evening</i> by Robert Frost</b> <b>Poem 13 : <i>Sonnet 29</i> by William Shakespeare</b> <b>'The Joy of Reading' – Selected Prose &amp; Poetry</b>	<b>Weightage: 33%</b>
<b>Unit 2</b> <b>Number of lectures: 4</b> <b>Indirect Narration</b> <b>Conjunction</b> <b>Use of Phrasal Preposition and Verbs: (1) In spite of (2) Instead of (3) Owing to (4) Due to (5) Because of (6) With a view to (7) On account (8) According to (9) In order to (10) Account for (11) Abide by (12) Look for (13) Wind up (14) Come across (15) Break into (16) Give in (17) Keep up (18) Look forward to (19) Put off (20) Set out (21) Run into (22) Look after (23) Bring up (24) Get off (25) Cut down (26) Fall through (27) Work out (28) Shut down (29) Hand over (30) Pull down</b>	<b>Weightage: 17%</b>

<b>Unit 3</b> <b>Number of lectures: 8</b> Translation from English to Gujarati/Hindi	<b>Weightage: 33%</b>
<b>Unit 4</b> <b>Number of lectures: 4</b> Dialogue Writing	<b>Weightage: 17%</b>

## REFERENCES

1. High School English Grammar – Wrenn & Martin
2. Contemporary English Grammar – David Green

## INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing English language structures.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit 1	33	8
Unit 2	17	4
Unit 3	33	8
Unit 4	17	4
<b>Total</b>	<b>100</b>	<b>24</b>

## **GENERIC ELECTIVE**

### **EGC-501**

#### **Environment Science and Disaster Management**

**RATIONALE OF STUDY:** To learn about the area of environment science with selection of elective paper. This paper is designed to enable students to acquire basic understanding of the environment, environmental disasters and its management. It also provides information about mitigation methodology for the environmental disasters. It also gives information about psychological health and mental therapies and social awareness.

#### **LEARNING OUTCOMES:**

The students will learn about the basic concepts of environmental disasters, pre disaster management and post disaster management, and social awareness.

**TEACHING & EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of their regular attendance in classroom & external (50 marks) university examination.

<b>Course</b>	<b>Title</b>	<b>Credit</b>	<b>Theory (hrs/week)</b>	<b>External</b>	<b>Internal</b>	<b>Total</b>
<b>EGC-501</b>	<b>Environment Science and Disaster Management</b>	<b>2</b>	<b>2</b>	<b>50</b>	<b>-</b>	<b>50</b>

#### **COURSE CONTENT**

<b>Unit I</b> <b>Number of lectures: 12</b> <ul style="list-style-type: none"><li>• Introduction to Environment</li><li>• Global Environmental Issues: Climate Change, Ozone layer depletion, Global Warming</li><li>• National Environmental issues: Water Pollution Management, Air Pollution, Vehicular pollution management, E-waste, Desertification Issues, Wild Life and Forest Management</li><li>• EIA ( Environment Impact Assessment)</li></ul> <b>Weightage: 50%</b>
<b>Unit II</b> <b>Number of lectures: 12</b> <ul style="list-style-type: none"><li>• General concept of disaster management: Introduction, Primary concept, from</li></ul> <b>Weightage: 50%</b>

management to mitigation of disaster

- risk assessment and vulnerability analysis
- public awareness and training,
- Causes and effects of disaster
- Pre disaster management: various steps/arrangement during pre disaster management.
- Management during disaster and post disaster: earth quake, drought, diseases, flood, cyclones, land slide,.

#### REFERENCES:

1. Modi C D & others (2006) Paryavaran and Aapatti Vyavasthapan [Gujarati], Swami prakashan, Patan-384265
2. Patel J C (2006) Paryavaran and disaster management [Gujarati], Parshwa publication, Ahmedabad-380001
3. Erachs Bharucha (2008, first edition) Paryavaran Adhyayan [Gujarati], Orient Longman Pvt. Ltd., Hyderabad.
4. Distributor: M/S Himanshu book company, 06-07 Shri Jayendrapuri Bhavan, Ellisbridge, New Sanyas Ashram, Ahmedabad – 380 006.
5. K Ramana Murthi, 2004 Disaster Management, Dominant Publishers and Di sributors, New Delhi -110002

#### TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24

## Subjective Elective

### Synthetic Dyes

#### Paper: ECH- 501 A

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the synthetic dyes

#### LEARNING OUTCOMES:

- Understand the dyes and pigments.
- Develop an understanding of the various dyes and their synthetic methods.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
ECH-501A	Synthetic Dyes	2	24	00	50	50

#### UNIT :- I :

**Number of lectures: 12**

**Weightage: 50%**

- Introduction
- Synthetic Dyes
- Chromophores, Chromogens, auxochromes, Bathochromic shift, Hypsochromic shift
- Difference between Dyes and Pigments  
Classification of Dyes
  - According to constitution
  - According to method of coloring the fibers
  - Optical Brighteners

#### UNIT :- II :

**Number of lectures: 12**

**Weightage:50%**

- Chemical and physical structure of fibers
- Interaction of dye with fiber
- Dyeing process with different classes of dyes

- Synthesis of some dyes:
  1. Congo Red Eosin
  2. Alizarin
  3. Crystal Violet Indigo
  4. Methylene Blue

### Reference books

1. Synthetic Dyes by Venkatramanan
2. Industrial chemistry by B. K. Sharma
3. Industrial dyes by Klaus Hunger
4. Synthetic Dyes by G.R.Chatwal
5. Synthetic Dyes and Drugs by O.P.Agrawal
6. Synthetic Dyes by O. D. Tyagi & M. Yadav
7. Sanshlesit Rangako, Granth Nirman Board

### INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to dyes
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

### TEACHING AND EXAMINATION

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24

# Oils, Fats and Waxes

## Paper: ECH- 501 B

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the Oils, fats and waxes

### LEARNING OUTCOMES:

- Understand the classification of oils, fats and waxes.
- Develop an understanding of the various analysis methods of oils, fats and waxes.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
ECH-501B	Oils, Fats and Waxes	2	24	00	50	50

### UNIT:- I : Oils, Fats, and Waxes

Number of lectures: 12

Weightage: 50%

- Introduction
- Distinction between oils and fats properties Classification
- Vegetable oils  
Manufacture of cotton seed oil by expression and solvent extraction Manufacture of soybean oil by solvent extraction  
Refining of crude vegetable oils Some other vegetable oils
- Animal oils, animal fats and oils Processing of animal fats and oils Mineral oils
- Difference between animal, vegetable and mineral oils Essential oils
- Isolation and uses of essential oils Waxes
- Classification of waxes Properties of waxes
- Some common waxes
- Qualitative solubility of waxes

### UNIT:- II : Analysis of Oils, Fats and Waxes



**Number of lectures: 12**

**Weightage: 50%**

- Saponification value Ester value
- Acid value
- Iodine value-wijs methods Richert meissl value
- Henher value
- Elaiden test Aniline point
- Hydrogenation of oils
- Optimum conditions for the Hydrogenation process The dry process
- The wet process
- Manufacture of candles

**Reference Books :**

1. Industrial Chemistry By B. K. Sharma
2. Dryden's Outlines of Chemical Technology, 3<sup>rd</sup> Edition , East-West Press

**INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Oils, fats and waxes
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

**TEACHING AND EXAMINATION**

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24

### Third Year B.Sc. (Chemistry)

### Semester VI

Subject code	Study components	Instructions Hrs / week	Examination			Credit
			Internal	University Exam	Total	
<b>CCH-601</b>	Advanced Inorganic Chemistry	3	30	70	100	3
<b>CCH-602</b>	Advanced Organic Chemistry	3	30	70	100	3
<b>CCH-603</b>	Advanced Physical Chemistry	3	30	70	100	3
<b>CCH-604</b>	Advanced Analytical Chemistry	3	30	70	100	3
<b>CCH-601</b>	Chemistry Practical-VI	12		200	200	6
<b>FCG-601</b>	Basic English – VI	2	15	35	50	2
<b>ECH- 601 A or ECH- 601 B</b>	Food Additives or Forensic Chemistry & Toxicology	2		50	50	2
<b>EGC- 601</b>	Advanced Communication Skills	2		50	50	2
		<b>30</b>	<b>13 5</b>	<b>61 5</b>	<b>750</b>	<b>24</b>

## CCH-601- Advanced Inorganic Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the Inorganic Chemistry. Basic properties of inorganic chemistry are taught to make the students aware about it.

### **LEARNING OUTCOMES:**

- Understand the concept of origin of inorganic chemistry.
- Develop an understanding of the reaction mechanism occurring in any chemical reaction.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH-601	Advanced Inorganic Chemistry	3	45	30	70	100

### **COURSE CONTENT**

#### **UNIT :- I : Valency**

**Number of lectures: 15**

**Weightage:34%**

- Variation method, Secular Equation, Stability of  $H_2^+$  ion; M.O. approach, Stability of  $H_2$  molecule; V. B. approach, Classical interaction energy
- Representation of wave function for  $SP$ ,  $SP^2$  and  $SP^3$  hybrid orbitals, bond angle and bond strength
- M.O. treatment of  $Oh$  molecules
- Quantum mechanical representation of Pauli's exclusion principle

#### **UNIT :- II : Metal Carbonyl**

**Number of lectures: 15**

**Weightage:33%**

- Introduction
- Classification: Mononuclear and Polynuclear Physical and Chemical Properties
- Metal Carbonyl (M-CO) bonding (On the basis of V.B.T. and M.O.T.) Use of IR Spectra to determination of structure of metal carbonyl
- Structure of Metal Carbonyl
  - $Ni(CO)_4, Fe(CO)_5, Cr(CO)_6, Fe_2(CO)_9, Co_2(CO)_8, Mn_2(CO)_{10}, Fe_3(CO)_{12}$

- Calculation of EAN of metal atom in metal carbonyl Metal Nitrosyl complexes:  
- Bonding in metal nitrosyl, Classification of metal Nitrosyl

### **UNIT :- III : Bio-Inorganic Chemistry**

**Number of lectures: 15**

**Weightage:33%**

- Introduction,
- Essential elements, Trace elements
- Metal porphyrins
- Study of hemoglobin and myoglobin
- Nitrogen fixation: In Vivo and In Vitro

#### **Books Suggested (Inorganic Chemistry)**

1. Valency and Molecular structure by Cartmell and Fowles.
2. Inorganic Chemistry: Principles of Structure and Reactivity by James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi
3. Advanced Inorganic Chemistry by G. D. Tuli, Madan, Basu and Satyaprakash
4. Bioinorganic Chemistry by G. R. Chatwal
5. Quantum chemistry by R. K. Prasad
6. Concise inorganic Chemistry by J. D. Lee

### **INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Chemistry
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

### **TEACHING AND EXAMINATION**

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH-602-Advanced Organic Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding and the importance of Organic Chemistry.

### **LEARNING OUTCOMES:**

- Understand the concept of analytical chemistry.
- Applications of inorganic compounds

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH-602	Advanced Organic Chemistry	3	45	30	70	100

### **COURSE CONTENT**

#### **UNIT :- I : Electrophillic and free radical addition reaction**

**Number of lectures: 15**

**Weightage:34%**

- Addition to carbon carbon double bond Markovnikov's rule
- Electrophillic addition, Orientation, Reactivity, Rearrangement, Dimerization, Alkylation
- Peroxide effect ( Anti markovnikov's rule)
- Free radical addition, mechanism of peroxide initiated addition of HBr Syn and anti addition mechanism for addition of halogens
- Electrophillic addition to conjugated dienes ( 1: 2 v/s 1: 4 addition ) Free radical addition to conjugated dienes, reactivity

#### **UNIT :- II : Active Methylene Group Compounds**

**Number of lectures: 15**

**Weightage:33%**

- Introduction of Tautomerism

- Determination of keto-enol tautomerism
- Differences between Tautomerism and resonance
- Synthesis and application of Ethyl aceto acetate and malonic ester

### UNIT :- III

Number of lectures: 15

Weightage:33%

#### (A) Carbohydrates

- Introduction of Disaccharides Structure determination of
  - Sucrose
  - Maltose

#### (B) Isoprenoids

- Classification
- General methods of structure determination Isoprene rule
- Constitution of Citral and  $\alpha$ -Terpeneol and their synthesis

#### Books Suggested (Organic Chemistry):

1. Organic chemistry by Morrison & Boyd V<sup>th</sup> Edition
2. Advance organic chemistry by R.K.Bansal.
3. Organic chemistry by I.L.Finar Vol I & II V<sup>th</sup> Edition
4. Organic chemistry by pine, Hendrikson, Cram and Hammond IV<sup>th</sup> edition.
5. Synthetic organic chemistry by Gurdeep R Chatwal.
6. Advanced organic chemistry by Jerry March.
7. Organic reactions and their mechanisms II<sup>nd</sup> edition by P.S. Kalsi.
8. Organic chemistry of natural product Vol: I & II by Gurdeep R. Chatwal.
9. Advanced organic chemistry by Arun Bahal and B.S. Bahal.
10. Organic chemistry Vol, I, II, III by S.M.Mukherjee, S.P.Singh, R.P.Kapoor.

### INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Chemistry
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH-603-Advanced Physical Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding and the importance of Physical Chemistry.

### **LEARNING OUTCOMES:**

- Understand the concept of Physical chemistry.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
CCH-603	Advanced Physical Chemistry	3	45	30	70	100

### **COURSE CONTENT**

<b>UNIT:- I : Statistical Thermodynamics</b> <b>Number of lectures: 15</b>	<b>Weightage:34%</b>
<ul style="list-style-type: none"><li>• Introduction</li><li>• Combination and permutation</li><li>• Probability</li><li>• Sterling approximate formula (No Derivation)</li><li>• Type of Statistics<ul style="list-style-type: none"><li>Maxwell-Boltzmann Statistics</li><li>Bose-Einstein Statistics</li><li>Fermi-Dirac Statistics</li></ul></li><li>• Partition Function<ul style="list-style-type: none"><li>Translational Partition function</li><li>Rotational Partition function</li><li>Vibrational Partition function</li><li>Numericals</li></ul></li></ul>	
<b>UNIT :- II : Photochemistry</b> <b>Number of lectures: 15</b>	<b>Weightage:33%</b>



- Introduction
- Difference between Thermal and Photochemical reaction The Law of Absorption, Lambert-Beer law
- Laws of Photochemistry,
  - (1) Grotthuss-Draper law (2) Stark- Einstein law and it's deviation
- Quantum Efficiency or Quantum Yield
- Experimental determination of Quantum yield Reason of high and low Quantum yield
- Types of Photochemical reaction
  - (1) Photosensitized reaction (2) Photochemical equilibrium
- Qualitative description of fluorescence, phosphorescence and chemiluminescence.
- Flash Photolysis Numerical

**UNIT :- III : Chemical Kinetics**

**Number of lectures: 15**

**Weightage:33%**

- Effect of temperature on rate of reaction (Arrhenius equation)
- Concept of Activation energy
  - Theories of reaction rate
    - Collision theory
    - Transition state theory
- Comparison of collision and transition state theory
- Theories of Unimolecular reaction
  - Lindemann's theory
  - Trimolecular reaction
  - Trautz's Law
- Primary salt effect
- Secondary salt effect Numerical

**Books Suggested (Physical Chemistry) :-**

1. Advance Physical Chemistry by Gurdeep Raj.
2. Physical Chemistry (Question and Answer) by R. N. Madan, G.D. Tuli, S.Chand.

3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Chemical Thermodynamics by R.P. Rastogi and R.R.Mishra.
5. Physical chemistry by atkins.
6. Essentials of Physical Chemistry by B. S. Bahal, Arun Bahal, G.D.Tuli,
7. Physical Chemistry by P.W. Atkins, 5<sup>th</sup> edn, Oxford 1994 7<sup>th</sup> edn-2002.
8. Physical Chemistry by R.A. Albern and R.J.Silby, John Wiley 1995.
9. Physical Chemistry by G.H. Barrow, 5<sup>th</sup> edn, Mac Graw Hill, 1988,6<sup>th</sup> edn, 1996.
10. Physical Chemistry by W.J.Moore, 4<sup>th</sup> edn, Orient Longmans 1969.

### **INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.

### **TEACHING AND EXAMINATION**

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit I	34	15
Unit II	33	15
Unit III	33	15
Total	100	45

## CCH 604- Advanced Analytical Chemistry

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the basic principles of analytical chemistry.

### **LEARNING OUTCOMES:**

- Understand the concept of Analytical sciences.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 30 marks and End Term Examination conducted by University examination for 70 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hr S.	Max Marks		
				Mid Term	End Term	
CCH- 604	Advanced Analytical Chemistry	3	45	30	70	100

### **COURSE CONTENT**

#### **UNIT :- I Advanced UV-Vis Spectrophotometry**

**Number of lectures: 15**

**Weightage:33%**

- Introduction
- Measurement of Ultraviolet-Visible Light Absorption
- Classification of Electronic transitions and chromophores
- Beer-Lambert's Law, its limitation
- Shapes of Absorption curves: Frank-Condon Principle
- Derivative Spectrophotometry
- Solvent Effects and  $\lambda_{max}$  shifts

#### **Application of Woodward-Fieser Rules for Structural Analysis (and related problems)**

- Conjugated dienes and polyenes
- Conjugated ketones, aldehydes, acids and esters

#### **UNIT- II : NMR spectroscopy**

**Number of lectures: 15**

**Weightage:34%**

- Introduction
- Proton magnetic resonance ( $^1H$  NMR) spectroscopy  
Equivalent and non equivalent protons

- Nuclear shielding & de-shielding
- Chemical shift & molecular structure
- Spin-spin splitting and coupling constant Area of signals
- Interpretations of PMR spectra
- Simple organic molecule such as ;  
 (1) Ethyl bromide (2) Ethanol (3) Acetaldehyde (4) 1,1,2-Try bromo ethane  
 (5) Ethyl acetate (6) Toluene (7) Acetophenone (8) Iso propyl Benzene (9) Acetic acid  
 (10) Phenetol

**UNIT :- III : IR spectra & Numericals based on UV, IR and NMR Spectra**

**Number of lectures: 15**

**Weightage:33%**

**(A) Infrared spectroscopy.**

- Introduction
- Molecular vibrations ( Fundamental vibrations of AX<sub>2</sub> type molecules)  
 Characteristics of IR spectroscopy
- Sample techniques Fingerprint zone
- Effect of IR in geometrical isomerism IR spectra & H-bonding
- Factor affecting on >C=O group frequencies
- Differentiate two compounds by the IR frequencies.

**(B)** Problems pertaining to the structure elucidation of organic compounds using UV, IR & NMR spectroscopic techniques (one out of two)

**Suggested books: (structural chemistry)**

1. Basic principles of spectroscopy by R.Chand
2. Spectrometric identification of organic compounds IVth edition by Silverstain, Bassler and Morrill.
3. Application of absorption spectroscopy of organic compounds by John R. Dyer
4. Spectroscopic method in organic chemistry Vth edition by Dudley H. Williams & Ian Fleming
5. Organic spectroscopy by Williams & Kemp
6. Organic spectroscopy by V.R.Dani
7. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J.Holler
8. Principles of Analytical Chemistry J.H. Kennedy
9. Analytical Chemistry – Principals & Techniques L.G.Hargis
10. Organic Structural Spectroscopy- J.B. Lambert, H.F. Shurvell, D.A. Lightner, R.G. Cooks, Prentice Hall, New Jersey, USA, 1998.

**INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.

#### **TEACHING AND EXAMINATION**

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit 1	33	15
Unit 2	34	15
Unit 3	33	15
Total	100	45

## PCH 601-Chemistry Practical-VI

**RATIONALE:** This course is designed to enable students to acquire on hand basic understanding of the chemical world, its origin and structure to help the potential application of the unexplored and unidentified compounds in the industry. These practical make the students capable and competent to work in chemistry related industries.

### LEARNING OUTCOMES:

- Understand the concept of origin of chemistry.
- Develop an understanding of the chemical properties of compounds.
- Gain knowledge about the structure, function and applications of the chemicals compounds.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. General viva-voce will be conducted to analyze the knowledge of the student.

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs.	Max Marks	
PCH- 601	Chemistry Practical-VI	6	12	200	200

### B. Sc. Chemistry

Semester : VI

Laboratory Course

PCH - 601

(Inorganic, Organic, Physical Chemistry)

**Inorganic Chemistry practical**

#### Qualitative analysis (Minimum 8)

Inorganic mixture should be comprised of six radicals.

Candidate if required should be guided once for the wrong group and marks deducted for wrong group. Maximum of five marks can be deducted for wrong group. There shall be no deduction of marks for reporting wrong radicals

**Organic Chemistry practical**

**(A) Estimation of functional groups: (Minimum 03)**

- (1) Estimation of Ester
- (2) Estimation of Amide
- (3) Estimation of Ascorbic acid
- (4) Estimation of Aspirin

**(B) Synthesis of Organic Compounds (Minimum 05)**

- (1) Preparation of m-Dinitro benzene from Nitrobenzene
- (2) Preparation of p-Nitro acetanilide from Acetanilide
- (3) Preparation of Acetanilide from Aniline
- (4) Preparation of Aspirine from Salicylic acid
- (5) Preparation of Di-benzal acetone from Benzaldehyde
- (6) Preparation of 2,4,6-Tribromo aniline from Aniline

**Physical Chemistry**

**[Instruments]: (Minimum 05)**

1. To determine concentration of the given Iodide solution by Potentiometric titration against 0.1N  $\text{KMnO}_4$  solution.
2. To determine formal redox potential of  $\text{Fe}^{+2}/\text{Fe}^{+3}$  by Potentiometry.
3. To determine the concentration of the **nitrite** in the given solution by Colourimetric estimation method.
4. To determine the concentration of unknown solution from given  $\text{K}_2\text{Cr}_2\text{O}_7$  by Colourimetry.
5. To determine the Solubility product and solubility of sparingly soluble salt of  $\text{BaSO}_4$  by Conductometry.
6. To determine the strength of strong and weak base in a given mixture using a pH meter.

**[B] Kinetics, Adsorption & Polymer (Minimum 03)**

7. To study the reaction between  $\text{KBrO}_3$  and  $\text{KI}$  at two different temperature and calculate the temperature coefficient and the energy of activation.

8. To study the absorption of Acetic Acid on Charcoal and prove the validity of Freundlich equation.
9. To determine the molecular weight of high polymer (i.e. polystyrene) by viscosity measurement.
10. To study the rate constant of the reaction between  $K_2S_2O_8$  and KI and study the influence of ionic strength on the rate constant

### **INSTRUCTION STRATEGIES**

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipments, precautions and safety measures in class and demonstration of important steps.
2. Monitoring of the students performing the experiments.
3. Evaluation of results of each experiment.



## **PRACTICAL EXAMINATION PATTERN FOR CHEMISTRY:**

### **Pattern of University Practical Exam**

**Time: 10:30am to 6:00pm (Including 30 minutes recess) Total Marks: 200**

#### **First Day**

##### **(A) Inorganic (50 marks)**

- Inorganic Qualitative Mixture

##### **(B) Organic (50 marks)**

- Estimation (25 Marks) & Preparation (25 Marks)

#### **Second Day**

##### **(C) Physical (50 marks)**

- Any one exercise should be selected for each candidate from syllabus.

##### **(D) Viva-Voce and Journal**

###### **Viva-Voce on practical base (40 marks)**

- Inorganic .....13 marks
- Organic .....13 marks
- Physical .....14 marks

###### **Journal (10 marks)**

**Note: Without Certified practical record a student will not be permitted to appear at practical examination**

## **FCG 601- Basic English – VI**

**RATIONALE:** This course is designed to enable students to acquire basic understanding of English grammar. The course would help students to fortify their knowledge of English and strengthen their basic communication abilities.

**LEARNING OUTCOMES:**

- Understand the functions and usage of sentence framing, sentence correction and synthesis the sentences
- Develop language skills of reading through filling in appropriate words in blanks, correcting errors, choosing correct forms, etc.
- Acquire interest in English language and literature through textbook lessons.
- Acquire writing skill through developing story.
- Acquire the speaking skill through speeches.

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term Examination conducted by University examination for 35 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
FCG - 602	Basic English – VI	2	24	15	35	50

<p><b>Unit 1:</b></p> <p><b>Number of lectures: 8</b> <span style="float: right;"><b>Weightage 33%</b></span></p> <p><b>Lesson 2 : <i>Between the Mosque</i></b></p> <p><b>Lesson 7 : <i>My Financial Career</i></b></p> <p><b>Lesson 8 : <i>Speech on Indian Independence</i></b></p> <p><b>Poem 14 : <i>The World is Too Much with us</i></b></p> <p><b>Poem 15 : <i>Success is Counted Sweetest</i></b></p> <p><b>Poem 16 : <i>I, Too, Sing America</i></b></p> <p><b>The Joy of Reading</b> selected Prose &amp; Poetry</p>
---

<b>Unit 2 : Grammar</b>	
<b>Number of lectures:4</b>	<b>Weightage: 33%</b>
<ul style="list-style-type: none"> <li>- Transformation , Correction (Articles, prepositions, Tenses, Concord)</li> <li>- Synthesis of Sentences</li> </ul>	
<b>Unit 3</b>	
<b>Number of lectures: 8</b>	<b>Weightage: 33%</b>
Developing a Story	
<b>Unit 4 Preparing Speeches</b>	
<b>Number of lectures: 4</b>	<b>Weightage: 33%</b>
<ul style="list-style-type: none"> <li>- Introducing Chief Guest</li> <li>- Farwell Speech</li> <li>- Speech on annual functions</li> <li>- Mourning the Death of VIP</li> <li>- Speech on Republic Day</li> </ul>	

## REFERENCES

1. High School English Grammar – Wrenn & Martin
2. Contemporary English Grammar – David Green

## INSTRUCTION STRATEGIES

1. Interactions with the students to understand the level of students
2. Explaining & discussing English language structures.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

## TEACHING AND EXAMINATION

UNIT	Examination Scheme	Teaching Scheme
Unit 1	33	8
Unit 2	17	4
Unit 3	33	8
Unit 4	17	4
<b>Total</b>	<b>100</b>	<b>24</b>

**GENERIC ELECTIVE**  
**EGC 601-Advanced Communication Skills**

**RATIONALE:** This course is designed to enable students to acquire basic understanding of Phonetics. The students would be made familiar with the stress, punctuation and fluency of English words and sounds. The course would help students to know the sentence patterns and grammatical structures.

**LEARNING OUTCOMES:**

- To build confidence for communicating in English and create interest for the life-long learning of English language
- To describe and characterize spoken English both from the grammatical and the discourse perspectives.
- To describe guidelines and identify the difficulties Indian students and users of English as a foreign language have in the use of the English language in oral contexts.
- To draw comparisons between oral and written language through the use of representative oral and written language.

**TEACHING AND EVALUATION SCHEME:**

The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of Mid Term examinations for 15 marks and End Term Examination conducted by University examination for 35 marks.

Subject Code	Subject Title	Credit	Theor			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
EGC 601	Advanced Communication Skills	2	24	15	35	50

**COURSE CONTENT**

<p><b>Unit – I Basics of Listening:</b> <b>Number of lectures: 12</b></p> <p>(a) Listening Ability (b) Hearing and Listening (c) Types of Listening</p>	<b>Weightage: 50%</b>
---	-----------------------

(d) Barriers to Effective Listening	
<b>Unit – II Writing Skills:</b>	<b>Weightage: 50%</b>
<b>Number of lectures: 12</b>	
<ul style="list-style-type: none"> <li>(a) Resume writing (Application Que)</li> <li>(b) Business Letters (Application Que)</li> <li>(c) Report Writing (Application Que)</li> <li>(d) E-mail etiquettes</li> </ul>	

**RECOMMENDED READING:**

1. V. Sasikumar : A Course in Listening and Speaking – I, Cambridge Uni. Press
2. G. Taylor:English Conversation Practice, Tata Mcgraw-Hill Publishing Co. Ltd.
3. Wrenn & Martin:High School English Grammar & Composition, S, Chand Pub.
4. Kumar S and Lata P Communication Skills 2011: New Delhi Oxford University Press

**INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students.
2. Explaining & discussing English language structures.
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, References, Copy of Articles, Models, diagram

**TEACHING AND EXAMINATION**

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24

**Subjective Elective**  
**ECH-601A Food Additives**

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the Food additives.

**LEARNING OUTCOMES:**

- Various types of food additives
- Analysis, regulations and assessment of food additives

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
ECH-601A	Food additives	2	24	00	50	50

**UNIT :- I :**

**Number of lectures: 12**

**Weightage:50%**

- Introduction
- Food Additives and functionalities Food additives regulations
  - GRAS
  - The Delaney closes
  - Unintentional
- Assessment of Food Additives

**UNIT :- II :**

**Number of lectures: 12**

**Weightage:50%**

- Classification of Food additives Mechanism and chemistry of
  - Flavoring Agents
  - Emulsifiers
  - Acidulants
  - Antioxidants
  - Thickeners
  - Sweeteners
  - Food colours
  - Preservatives

- Aroma
- Functional classes Food Additives List of Authorized Food Additives Risk benefit Ratio

**Reference Books:**

1. Food Chemistry by Alex V. Ramani, MJP Publications, 2009
2. CRC Handbook of Food Additives 2nd Edition, Volume No. II, 2011
3. Tanya Louise Ditschun and Carl K. Winter 2000
4. Food and Safety and authority of Ireland Published by guidance of Food Additives 2010

**INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Food additives
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

**TEACHING AND EXAMINATION**

<b>UNIT</b>	<b>Examination Scheme %Weightage</b>	<b>Teaching Scheme No. of Lecture</b>
Unit 1	50	12
Unit 2	50	12
Total	100	24

## **ECH-601 B Forensic chemistry & Toxicology**

**RATIONALE:** This course is designed to enable students to acquire basic understanding of the Forensic Chemistry and Toxicology.

### **LEARNING OUTCOMES:**

- Various laws related to Crime investigation
- Analysis of substances having forensic significance

**TEACHING AND EVALUATION SCHEME:** The objective of evaluation is not only to measure the performance of students, but also to motivate them for better performance. Students are evaluated on the basis of End Term Examination conducted by University examination for 50 marks.

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
ECH-601B	Forensic Chemistry & toxicology	2	24	00	50	50

### **UNIT :- I : Introduction of Forensic science, Law, Crime**

**Number of lectures: 12**

**Weightage:50%**

- Introduction Definition, and Scope of Forensic Science History and development, Needs and Principles
- Police and Forensic sciences Laboratory
- Definition, Theories and Prevention of Crime Structure of Police, Police & Forensic Scientist
- Relationship with reference to Crime Investigation

### **UNIT :- II : Forensic Chemistry & Toxicology**

**Number of lectures: 12**

**Weightage:50%**

- Introduction of Forensic chemistry
- Types of cases received for analysis
- Overview of Forensic chemical analysis Forensic analysis of Beverages
  - Alcoholic Beverages (Alcohol, Chloroform)
  - Non-Alcoholic Beverages



- Examination of Chemicals (Phenolphthalein) used in Bribe Trap cases Analysis of Adulterated Food
- Introduction of Toxicology  
Classification of Toxicology Extraction of Poisons
- Analysis of Poisons

**Reference Books:**

- Forensic science in criminal investigation and trials, 4<sup>th</sup> edition by Dr.B.R.Sharma, Universal law Publishing co. pvt. Ltd.

**INSTRUCTION STRATEGIES**

1. Interactions with the students to understand the level of students
2. Explaining & Discussing the major terminologies related to Forensic Chemistry and Toxicology
3. Teaching the topics included in the syllabus with the help of teaching aids like OHP, LCD (Power point presentation), Notes, Question Banks, References and Reprints / Copy of Articles, Models, Diagrams
4. Assistance in solving of questions from our question bank.

**TEACHING AND EXAMINATION**

UNIT	Examination Scheme %Weightage	Teaching Scheme No. of Lecture
Unit 1	50	12
Unit 2	50	12
Total	100	24

## EXAMINATION PATTERN

**KADI SARVA VISHWAVIDYALAYA, GANDHINAGAR**

**B.Sc. Chemistry, Semester V/VI, End Term Examination,**

**Month-Year**

**Subject: Code-Title**

**Time: 3 hrs**

**Date**

**Maximum marks: 70**

Que. No : 1	(A) : Write any Two out of Three Questions (B) : Write any One out of Two Questions	12 Marks 08 Marks
Que. No : 2	(A) : Write any Two out of Three Questions (B) : Write any One out of Two Questions	12 Marks 08 Marks
Que. No : 3	(A) : Write any Two out of Three Questions (B) : Write any One out of Two Questions	12 Marks 08 Marks
Que. No : 4	Write any Ten out of Twelve (Four questions to be asked from each unit) Short question/MCQ/Short numerical/Diagram/Match the following	10 Marks
Total marks		70 marks

**KADI SARVA VISHWAVIDYALAYA, GANDHINAGAR**  
**B.Sc. Semester V/VI, END TERM Examination,**  
**Month-Year**  
**Subject: Subjective Elective/Generic Elective**

**Time: 2 hrs**

**Date**

**Maximum marks: 50**

Que. No : 1	Attempt any three out of Four (Descriptive)	21 Marks
Que. No : 2	Attempt any Four out of six (Short Notes)	20 Marks
Que. No : 3	Attempt any Three out of Four (Very Short Answers)	09 Marks
Total marks		50 marks